Photo courtesy of Eastern Kentucky University Justice & Safety Center

R-TECH™ NEWSLETTER
The Newsletter of the First Responder Technologies Program

Volume 2 • Issue 4 • April 2009

To contact R-Tech
E-mail: RTech@DHS.gov

IN THIS ISSUE

This Newsletter discusses technologies of interest to first responders that have received funding, in part, from the Federal government. Mention of these technologies should not be construed as an endorsement of either the technology, or the entity producing it, by the Federal government.

PIPELINE TO THE TOP

First Responders Have Direct Channel to Share Technology Ideas with DHS

No one knows better than boots-on-the-ground first responders what technologies they lack that would help them perform their jobs more safely, efficiently, and effectively. A program at the U.S. Department of Homeland Security Science and Technology Directorate (DHS S&T) has improved its methods for first responders to submit their own technology ideas directly to the government: TechSolutions.

TechSolutions recently launched a new Website, www.TechSolutions.DHS.gov, to make it easier to submit ideas. Through TechSolutions, first responders can submit ideas for technologies they would like to have that do not currently exist. TechSolutions is one of the four components of the First Responder Technologies (R-Tech) program, intended to protect America against terrorism and disasters by providing first responder solutions for high-priority capability gaps through rapid prototyping, technical assistance, and information sharing in order to save lives and maximize preparedness. An accepted submission to the TechSolutions Website can result in available technology in under a year.

"We typically look for technologies that can be prototyped within 12 to 15 months at a cost of a million [dollars] or less," said Greg Price, director of the TechSolutions program. Ideas are encouraged from all disciplines and from all levels of government. The program has produced successes already, including a fireground compass that provides orientation in a smoky environment, an ocular scanner that detects toxin exposure, and a next generation self-contained breathing apparatus (SCBA) that is lighter and thinner than existing models. A complete list of currently funded projects is available at www.TechSolutions.DHS.gov/Pages/CurrentlyFundedProjects.aspx.

Photo courtesy of FEMA photo library

On the TechSolutions Website, first responders can:

- Review ideas that have been submitted by other responders to avoid duplication of a request;
- View the development status of current projects; and
- Stay informed on the progress of their own submission(s) through automated e-mail responses and the "My Submissions" feature, which keeps a tally of a user's requests and provides relevant status information.

All submissions to the TechSolutions Website must come from first responders. "We currently do not accept ideas from vendors since there are other components at DHS that do that," said Price. The site requires users to create a login account which includes their department of agency information, thus ensuring that the users are first responders.

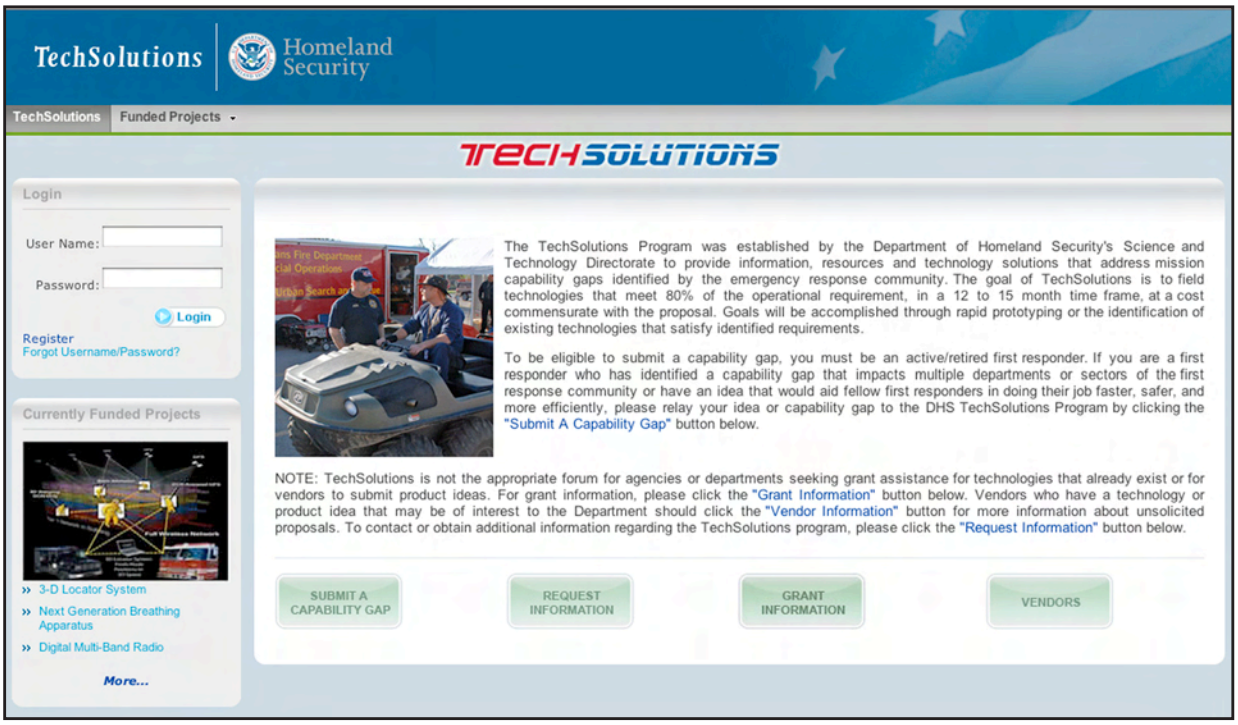
The TechSolutions program seeks out solutions that meet at least 80 percent of the operational requirements to close an identified technology gap. This allows a need to be addressed quickly while providing other DHS S&T components time to continue developing a longer-term strategy. "We do not expect to provide a 100-percent solution," said Price. "We let the research divisions within S&T flesh out any issues, and our research and development team and the national labs we work closely with will develop a much greater technology that can fill the 20-percent void we do not provide." For example, TechSolutions is developing a chemical detection or bio-detection tool that will identify thirteen toxic industrial chemicals (TICs) within the next year. The Chem-Bio Division of S&T is working on a different technology that will identify a much larger array of TICs, including bio-agents.

"The new Website will really streamline and improve the process, and submissions will be turned around much

Pipeline to the Top (continued)

faster," said Price. To provide the best service possible, DHS S&T will continue to improve the new Website based on first responder feedback. "Anything we can do to help the responders do their job easier and more efficiently, we want to know about it," said Price.

For more information on the TechSolutions program, or to see the new Website, visit www.TechSolutions.DHS.gov. For more information on the R-Tech program, visit www.FirstResponder.gov.



TESTING THE CUTTING EDGE

LA County Sheriff's Department a Testing Ground for Emerging Technologies

Commander Bob Osborne has a job that many first responders would envy. It is not his job with the Los Angeles County Sheriff's Department (LASD), but rather his job as head of LASD's Technology Exploration Program. From unmanned aircraft, to radar devices that see through walls, Osborne gets his hands on some of today's most cutting-edge first responder technologies.

As one of the largest law enforcement agencies in the country, LASD has the privilege of being a testing ground for many emerging technologies. "It is nice to be paid to do work you enjoy, and even better when you see science moving forward on devices that may help save a life. When you see something that has potential, that's fun, and it's enjoyable being part of the leading edge of that," said Osborne, a 34-year veteran of the department.

Working with the United States Department of Justice's (DOJ) National Institute of Justice (NIJ), the Technical Support Working Group (TSWG), the Pennsylvania State University's Applied Research Laboratory, the Department of Homeland Security's (DHS) Science and Technology Directorate (S&T), and other organizations, LASD helps find, develop, adapt, and test a number of devices that could ultimately support law enforcement around the country in their public safety mission.

One of the projects they have recently been working on with NIJ and Raytheon is a technology Osborne calls an "assault intervention device." Originally designed as an active denial system for the military, Osborne's group is trying to see if the directed-energy weapon, which creates a burning sensation in its targets, can be

Testing the Cutting Edge (continued)

scaled down to make it useful to law enforcement. The millimeter wave device could be used in a jail setting, for example, to stop an assault from a position of safety. "In a dorm assault, where you might have 150 inmates screaming, we can't stop that assault until we gather a response force, and we're hoping to utilize the technology to target the inmate that is precipitating the attack and stop it until we can bring in the cavalry," said Osborne.

Because the device was originally developed to be carried on the back of a Humvee, Osborne explained, they must first look at scaling it down into something an officer can carry. As transformation could potentially cost large sums of money, Osborne hopes it can first be determined if the device will be effective before expending federal funds. Osborne went so far as to test the device on himself. "I know it hurts because I stuck my hand in front of it, but I also know it did not damage my hand," he said. "And if I was someone intent on murdering another human being, we need to know if [the pain] will be intense enough to cause me to stop, and there is no way to know other than to use it."

Next month, Osborne's group will be testing the LED Incapacitator (LED-I), a technology funded by DHS S&T. The LED-I uses a light-emitting diode to send out continuously changing pulses of high-intensity light and color to disorient and incapacitate suspects. (See the July 2008 issue of the R-Tech Newsletter for more information).

LASD is also working on a technology with TSWG called the Forward Looking Viewing Unit (FLVU2). The FLVU2 is a ground link video device that is expected to be tested within the next few months. It will allow officers to send real-time video, pictures, diagrams, and other information between front line personnel and a command post. Osborne said they could ultimately send the information from the FLVU2 to other sites through encrypted communications equipment. "If we had a scenario we were facing and did not know what to do with it, we could find someone with the expertise and push a real time image to that person to ask what they thought [of the situation]," Osborne said.

Osborne's group is also looking into several "see-through-the-wall" radar devices with NIJ that would give tactical officers a better idea of what's on the other side of a closed door. "Think of a scenario where you may have a gunman holding multiple hostages," he said, "and an entry team has to effect a hostage rescue and needs to know what is on the other side, where hostages are in relation to a suspect, etc." The images produced by the devices are not quite television quality, cautions Osborne. Current devices provide only blips and shadows on a radar screen, and someone still has to interpret the results. "The science is amazing, but the user interface is fairly primitive, so there's a lot of development required before we move ahead."

Osborne said he sees a lot of "gee whiz" technology that cannot be used yet. For example, the unmanned aerial vehicles (UAV) that the Department of Defense has been using in Iraq require further development to satisfy Federal Aviation Administration (FAA) requirements and determining a useful payload for them is even more important. "The fact that one can fly a bombing mission in Iraq from a bunker in Arizona is useless until we attach the right payload," he said.

LASD takes great care in testing technologies. "When agencies are looking to develop something, we want to make sure it is something we can use, and that we don't waste money on some sexy sounding technology that law enforcement won't benefit from – spend it on something that has greater potential," said Osborne.

Osborne also says his superior, Sheriff Lee Baca, is very enthusiastic about the technology, not just for technology's sake, but as a tool to help law enforcement move forward. Osborne says they are willing to invest time and energy into exploring technology if it will benefit other departments, regardless of a department's size. "We believe we have a responsibility to the law enforcement profession because we are so large, and we don't want to be an 800-pound gorilla in the sand box – we want to be a good partner and share information that will be useful to our profession," he said.

For more information on the Technology Exploration Program, contact the Office of the Undersheriff at LASD at (323) 526-5666.

PROTECTING FIRST RESPONDERS

Non-Invasive Hydration Measurement Saves Lives

Despite the risk of burns, smoke inhalation or building collapse, the single largest cause of death in the United States, and the source of nearly half of all firefighter deaths, is sudden cardiac events. First responders in disciplines that require heavy personal protective equipment (PPE), such as HAZMAT encapsulating suits or bunker gear, also suffer the consequences. According to the United States Fire Administration, these stress- and exertion-related deaths double those caused by vehicle collisions – the next leading cause of death in the nation.

The National Fire Protection Agency has issued standards for field rehab, including replacing lost fluids as a key to preventing cardiac events. Measuring hydration levels could significantly reduce the number of deaths. But the question remains: how can you know when the responder has been drinking enough water?

"Dehydration is a problem on the fireground and for many first responders," said Dr. Denise Smith, Professor of Exercise Science at Skidmore College and Research Scientist at Illinois Fire Service Institute (IFSI). "It leads to fatigue, greater thermal strain, and greater cardiovascular strain." Smith has studied the markers for the physiological stress of firefighting at IFSI, including the effects of fluid loss and changes in plasma volume.

At the same time, a California-based company called Cantimer has been developing a hydration sensor using a polymer formulation. Working with a Small Business Innovation Research (SBIR) grant from the U.S. Army, the company knew that both the military and firefighters were concerned about heat exhaustion and heat stroke associated with dehydration. "People working in extreme-temperature environments, wearing heavy clothing, or carrying heavy equipment, can lose as much as a liter of fluid every twenty minutes, and that puts them at risk," said Robin Stracey, CEO of Cantimer. With inadequate hydration, the body's core temperature rises, increasing cardiovascular stress. "First responders were interested in having a reliable, convenient, non-invasive way to determine how dehydrated an individual is in the field," he said.


Photo courtesy of FEMA photo library

Photo courtesy of Cantimer

Cantimer's device is a little larger than the average cell phone, with a handheld reader and cartridges. The concept is similar to a glucometer, where the user pricks his or her finger and places a drop of blood on the cartridge to determine blood-sugar levels. Cantimer's device measures body hydration levels by having the user put a drop of saliva on the cartridge. The reader produces results in less than one minute.

Cantimer responded to a broad agency announcement put out by the Technical Support Working Group (TSWG) expressing an interest in studying dehydration in first responders. Cantimer was awarded a competitive contract and identified Smith's team in his proposal to benefit from someone doing physiological testing on an actual training ground. "We let them know we had several methods of measuring dehydration by looking at blood, urine output, etc.," said Smith. TSWG is also funding the research.

Smith began a controlled lab study at Skidmore College with individuals wearing PPE during a two-hour protocol. "We were looking at the underlying principle that saliva is a body fluid that can track or measure acute dehydration," she said.

Protecting First Responders (continued)

In the controlled study, Smith had subjects walk 10 minutes and rest 10 minutes, while she tracked changes in their body weight until the subjects lost three percent of their body weight. "Since we knew how much they lost, we measured their saliva throughout that period to see if saliva could track the change, and in fact we found it was a sensitive indicator of an acute change in body weight," said Smith.

Next, Smith took her testing to IFSI, where firefighters were undergoing training. This time she used both the Cantimer device and a Fiske Osmometer, which measures osmolality, or how much solute or dissolved salt (electrolytes and minerals), are in the saliva. She took saliva samples in the morning and recorded subjects' body weight, then took samples and weights again three to four hours later. The Fiske unit is large and designed for use in a laboratory, whereas the small Cantimer unit is designed to be portable and used in the field. The saliva was measured using both the Cantimer and Fiske devices and both measured exactly the same under sealed conditions.

Stracey said the Cantimer device will primarily be used by EMS personnel or paramedics who assist victims and first responders on scene. For example, when firefighters' tanks are out of air, they are supposed to go to a rehab station to be checked out by a paramedic. "The paramedic will use the device to judge whether or not they can go back to the fire," Stracey said. He also said the device could be used in ambulances for athletes, the elderly, and other groups who are at risk for dehydration. The device could be available later this year.

For more information on the Cantimer, visit www.cantimer.com/markets-products/hydration/index.html.

RKB.US

THE RESPONDER KNOWLEDGE BASE

Content Administrators on RKB

Vendors, testing agencies, government organizations, and other information providers can upload their information to the Responder Knowledge Base (RKB) Website. The RKB site currently has almost 70,000 registered users and 35,000 visits a month, so adding a product, publication, training record, or standard to RKB provides significant visibility.

Posting content to RKB is free of charge. As a result, most product records on RKB have been entered by the manufacturers themselves. This allows them to ensure the information on their products is accurate.
Adding information requires that the user be a content administrator. There are three steps to becoming a content administrator on RKB:

1. Go to www.rkb.us and create an account.
2. Call the help desk to schedule a content walk-through. For vendors, this is called a vendor content walk-through.
3. Complete the walk-through and begin to add your content.

The RKB staff reviews each record against acceptance criteria before publishing it. The acceptance criteria will depend upon the product's content area. For content to be accepted, the product must be related directly to emergency response and, in most cases, the records must be submitted directly from the manufacturer. Please note that RKB does not allow marketing language on the Website, and any such language will be removed prior to posting.

For submissions in other content areas, such as publications and training, RKB accepts content primarily from government or responder organizations. However, each request is considered on a case-by-case basis. RKB welcomes questions from any organization interested in posting content.

For more information, e-mail RKB at RKBMailbox@us.saic.com or call 1-877-FEMA-RKB (1-877-336-2752).